T* Ranch Sedimentology

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Abstract

T*Ranch is located 15 miles north of San Angelo, TX on the edge of the Permian basin and the Edwards Plateau, in the North Concho River drainage basin. The area of study is around 10,000 acres. Rocks in the subsurface consist of Permian Guadalupian and Ochoan series mixed siliciclastic, carbonate, and evaporite strata (Ferring, 2007). Cretaceous rocks exposed at the surface are characterized as shallow-marine, lagoon, beach shoals, and peri-tidal depositional environments deposited in a global transgressive sequence throughout the Comanchean Epoch (Rose, 1972). The depositional environments of the Cretaceous western-interior seaway were characterized by sedimentation patterns that affected the geometry of the seaway caused by regional tectonics related to the Laramide Orogeny (Blakey, 2014). Key signatures of the paleo-climate and depositional environment can be obtained from isotopic geochemistry stable isotope analysis, thin-section analysis, and certain fossil and trace fossil assemblages in the carbonate rocks on the Turner Ranch. Cretaceous surface exposures underwent burial from max global transgression, the seaway retreated due to Laramide uplifts, much erosion occurred affecting the Cretaceous rocks exposed and creating an unconformity. Quaternary alluvial and playa deposits gently covered Permian rocks and some of the Cretaceous rocks in the area of study. Surface geology on the T*Ranch consists of Cretaceous: (Kft) Fort Terrett and (Ka) Trinity Antler Sands formations as well as later Quaternary: (Qau) Alluvium Undivided and (Qal) recent stream deposits. Basin and Range extensional systems have affected the regional. geology.

Fig.1 Geologic Map

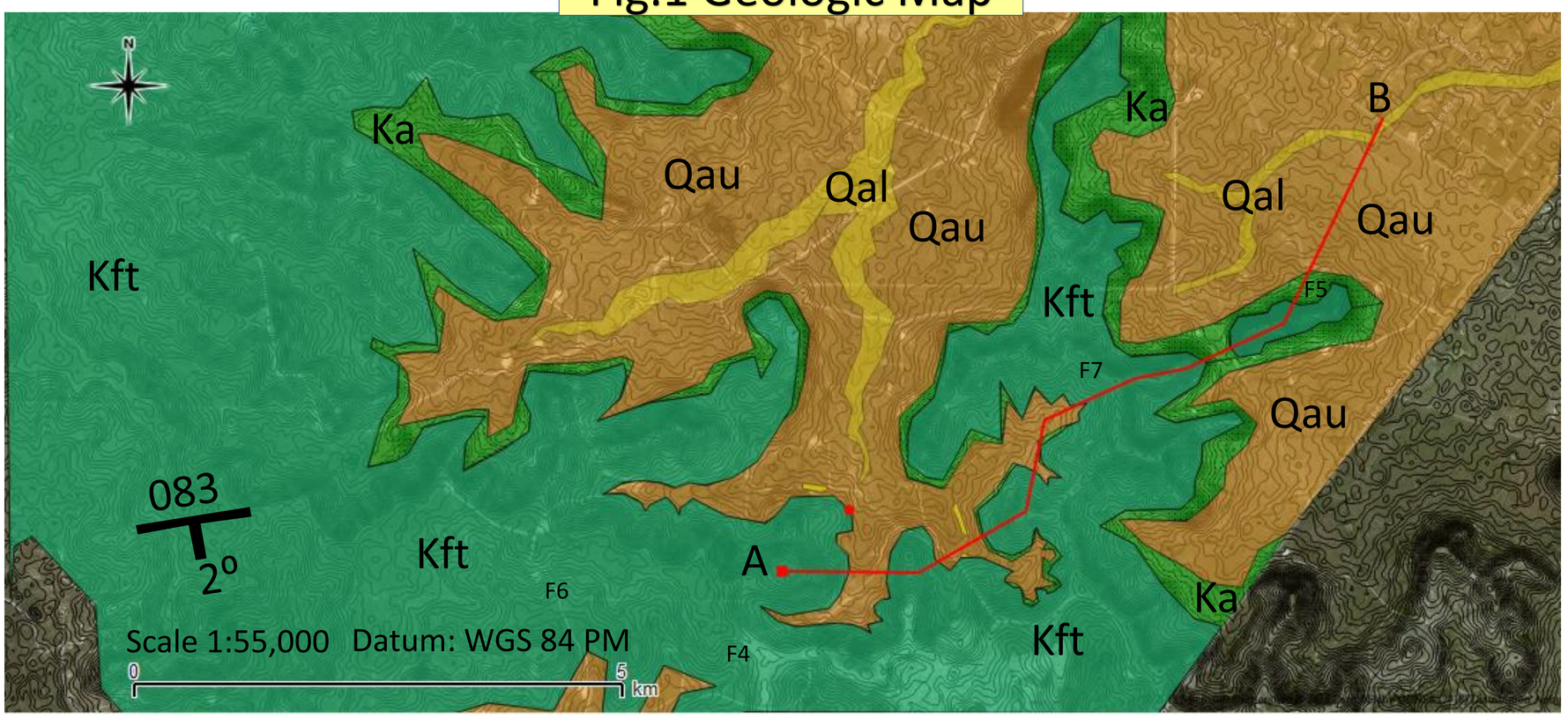


Fig.2 Geologic Cross-Section

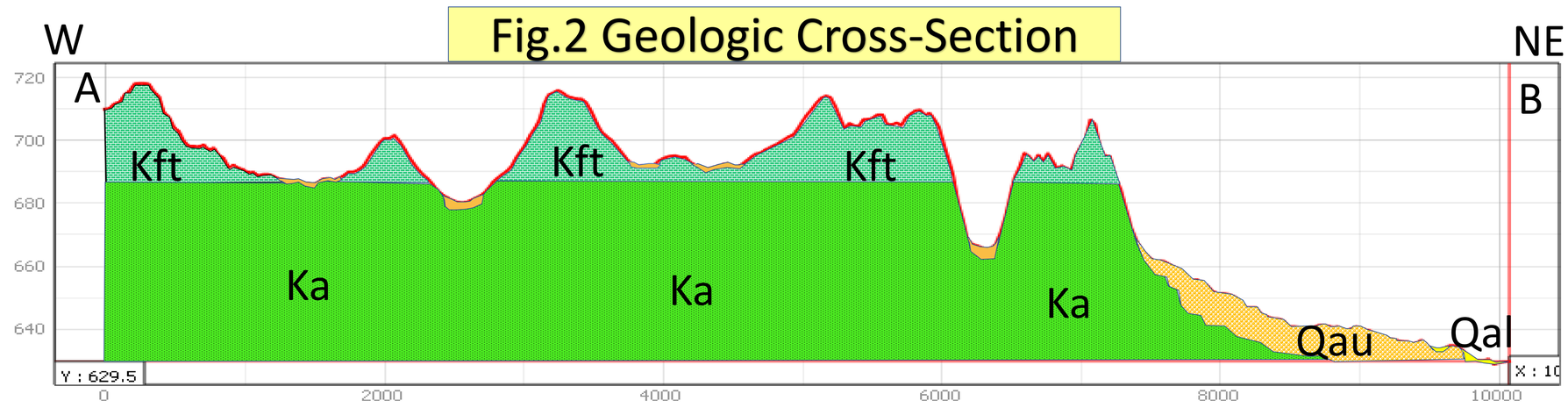
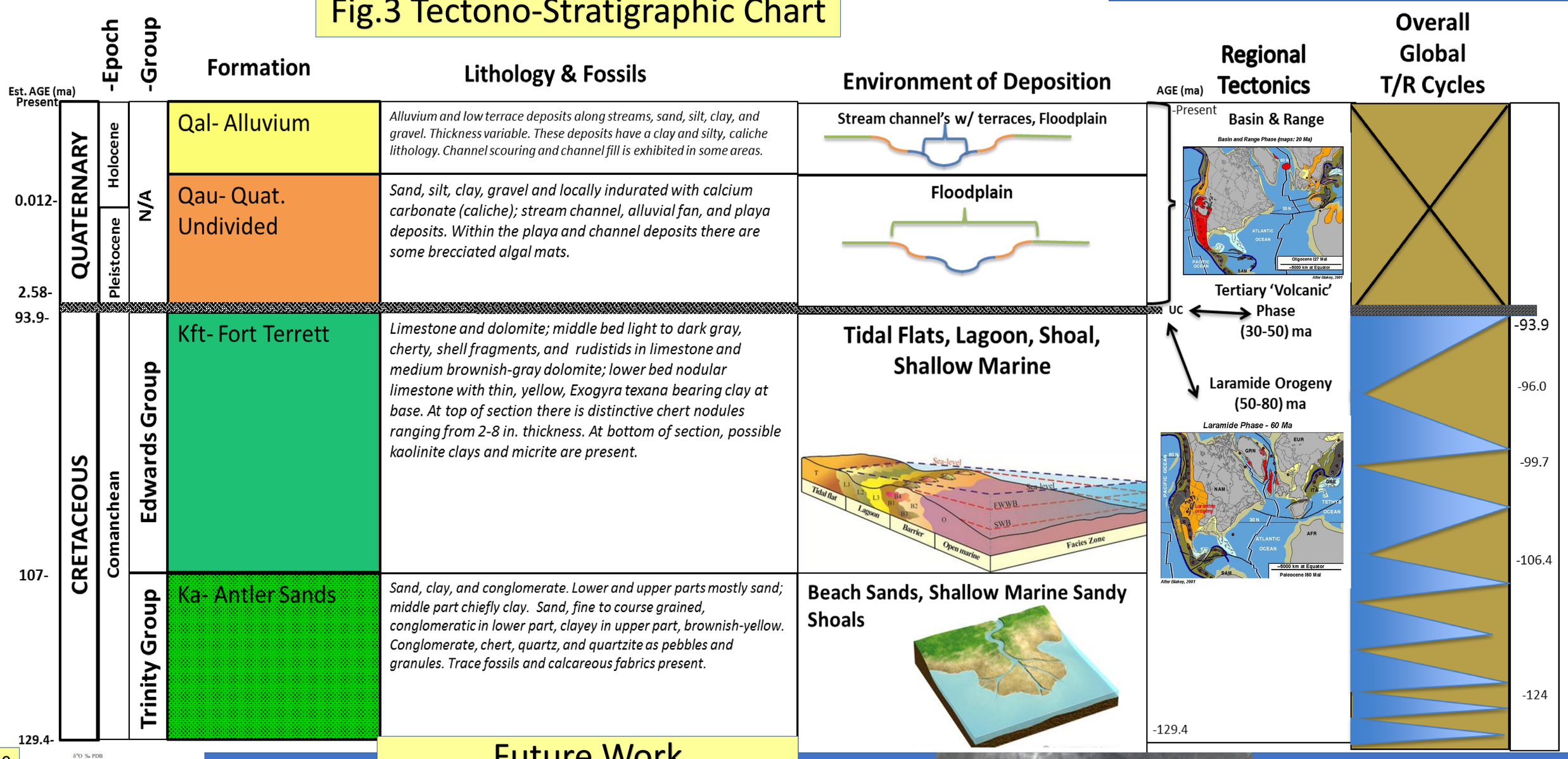


Fig.3 Tectono-Stratigraphic Chart



Fossils

Fig 4.

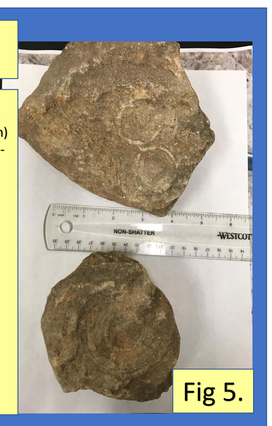


Fig 5.

Fig 4. Unidentified fossil in Kft, maybe a type of Mollusc, Polyplacophora (Chiton) or Aplacophora (spicule-covered, worm-like animals) Shown on map at F4.

Fig 5. Disc-shaped trace fossil in Ka, unidentified. Shown on map at F5.

Fig 6. Domal Algal-Stromatolite in Kft. Shown on map at F6

Fig 7. Rudistid fossils in the Kft. Shown on map at F7.

Fig 8. A figure of the generalized sedimentary characteristics and relationships among carbonate ramps.

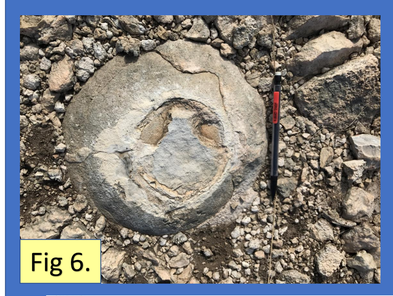


Fig 6.

Fig 7.

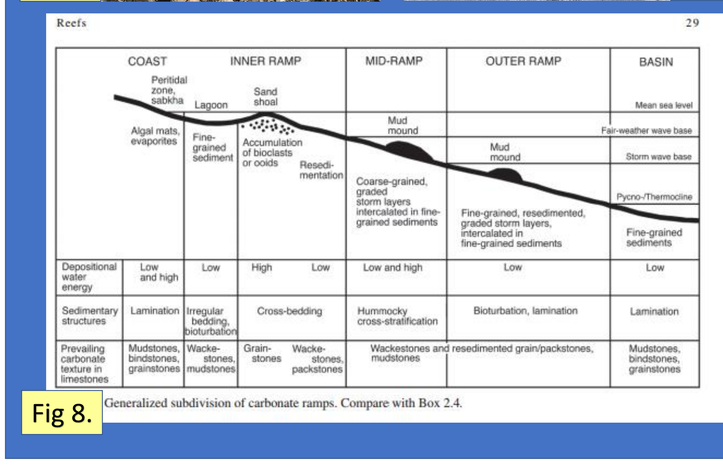


Fig 8. Generalized subdivision of carbonate ramps. Compare with Box 2.4.

Fig 1. Geologic Map of T*Ranch set at 1:55,000 scale and projected in WGS 84/Pseudo-Mercator.

Fig 2.Geologic Cross-Section along red line A-B.

Fig 3. Tectono-Stratigraphic Chart displaying the lithology, stratigraphy, and environments of deposition in relation to regional tectonic events and Global T/R Sea Level Curve data.

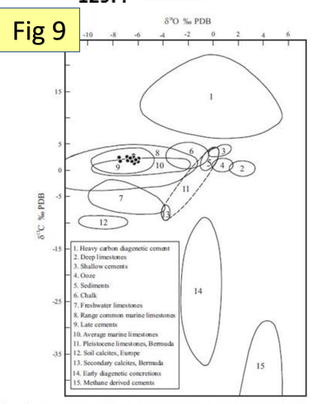
Future Work

Fig 9. δ13C versus δ18O Cross-Plot from (Hudson, J.D., 1977). Oxygen isotope investigations of carbonate rocks have given understanding into Paleo-depositional environments and sequence stratigraphy. Oxygen isotopic arrangements of carbonates are much inclined to modification amid diagenesis (Hudson, 1977). The results of this investigation are then plotted in a δ13C versus δ18O cross-plot chart.

Fig 10. SEM images of a quartz grains in the Ka Antler Sandstone, F10 on the map, that are leached with cement due to silicification processes. Scanning Electron Microscopy is important in order to better understand the rock fabric and textural properties as well as the diagenetic history of the rocks.

Also, 25 Thin-Section's await their return for examination. Thin-Section Petrography using a Petrographic Microscope will allow mineral identification as well as micro-textures, micro-fossils, and mineralogical structuring within samples.

Fig 9



δ°C vs. δ°O plot for the Shaluhod Formation limestones along with the different fields for carbonate rocks proposed by Hudson (1977)

Fig 10

SE 13:16 000000 WD29.4mm 10.0kV x400 100um

References

1. Ferring, C. R. (2007). Geology of Texas. Denton, TX: Thomson Brooks/Cole
2. Rose, P. R. (1972). Edwards group, surface and subsurface, Central Texas. Austin: Univ. of Texas, Bureau of Economic Geology..
3. Blakey, Ron C., 2014, Paleogeography and Paleo-tectonics of the Western Interior Seaway, Jurassic-Cretaceous of North America: AAPG Search and Discovery, Article #30392 (Available on-line at AAPG)
4. Hudson, J.D., 1977, Stable isotopes and limestone lithification: Journal of the Geological Society of London, 133(6), 637–660.